



#3

1

## SEQUENCE LISTING

<110> DING, SHI-YOU  
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<120> THERMAL TOLERANT MANNANASE FROM ACIDOTHERMUS  
CELLULOLYTICUS

<130> 40197.7US01

<140> 09/917,378  
<141> 2001-07-28

<160> 8

<170> PatentIn Ver. 2.1

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Phe Val Leu Asn Gly Leu Pro Tyr Arg Tyr Gly Gly Thr Asn Asn Tyr  
50 55 60  
Tyr Leu Ser Tyr Gln Ser His Ala Asp Val Asp Asp Val Leu Ala Lys  
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Ala Gln Ala Met Asn Leu Ser Val Ile Arg Thr Trp Gly Phe Ile Asp  
85 90 95  
Ile Gly Ser Leu Asp Gly Ser Val Pro Thr Ile Asp Gly Asn Lys Asn  
100 105 110  
Gly Phe Tyr Phe Gln Tyr Trp Asp Pro Ser Thr Gly Ala Pro Ala Tyr  
115 120 125  
Asn Asp Gly Pro Thr Gly Leu Gln Gly Leu Asp Tyr Ala Ile Ala Ser  
130 135 140  
Ala Ala Ala His Gly Leu Arg Val Ile Val Val Leu Thr Asn Asp Trp  
145 150 155 160  
Lys Glu Phe Gly Gly Met Asp Gln Tyr Asp Lys Trp Tyr Gly Leu Pro  
165 170 175

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Tyr | His | Asp | Asn | Phe | Tyr | Thr | Asp | Pro | Arg | Thr | Gln | Gln | Ala | Tyr | Lys | 180 | 185 | 190 |     |
| Asn | Trp | Val | Asn | His | Leu | Leu | Asn | Arg | Val | Asn | Ser | Ile | Thr | Gly | Val | 195 | 200 | 205 |     |
| Thr | Tyr | Lys | Asn | Asp | Pro | Thr | Ile | Phe | Ala | Trp | Glu | Leu | Ala | Asn | Glu | 210 | 215 | 220 |     |
| Pro | Arg | Cys | Val | Gly | Ser | Gly | Thr | Leu | Pro | Thr | Ser | Gly | Thr | Cys | Thr | 225 | 230 | 235 | 240 |
| Gln | Ala | Thr | Ile | Val | Asn | Trp | Val | Asp | Gln | Met | Ser | Ala | Tyr | Val | Lys | 245 | 250 | 255 |     |
| Ser | Ile | Asp | Pro | Asn | His | Met | Val | Ser | Val | Gly | Asp | Glu | Gly | Phe | Tyr | 260 | 265 | 270 |     |
| Ile | Gly | Ser | Thr | Gln | Gly | Ser | Gly | Trp | Pro | Tyr | Asn | Asp | Pro | Ser | Asp | 275 | 280 | 285 |     |
| Gly | Val | Asp | Asn | Asn | Ala | Leu | Leu | Arg | Val | Lys | Asn | Ile | Asp | Phe | Gly | 290 | 295 | 300 |     |
| Thr | Tyr | His | Leu | Tyr | Pro | Asn | Tyr | Trp | Gly | Gln | Asn | Ala | Asp | Trp | Gly | 305 | 310 | 315 | 320 |
| Thr | Gln | Trp | Ile | Lys | Asp | His | Ile | Ala | Asn | Ala | Ala | Ala | Ile | Gly | Lys | 325 | 330 | 335 |     |
| Pro | Thr | Ile | Leu | Glu | Glu | Phe | Gly | Trp | Gln | Thr | Pro | Asp | Arg | Asp | Ser | 340 | 345 | 350 |     |
| Val | Tyr | Gln | Thr | Trp | Thr | Gln | Thr | Val | Arg | Thr | Asn | Gly | Glu | Ala | Gly | 355 | 360 | 365 |     |
| Trp | Asn | Phe | Trp | Met | Leu | Ala | Gly | Asn | Val | Asn | Gly | Gln | Pro | Tyr | Pro | 370 | 375 | 380 |     |
| Asn | Tyr | Asp | Gly | Phe | Asn | Val | Tyr | Tyr | Pro | Ser | Ser | Thr | Ala | Thr | Val | 385 | 390 | 395 | 400 |
| Leu | Ala | Ser | Glu | Ala | Leu | Ala | Ile | Ser | Thr | Gly | Thr | Ser | Pro | Pro | Pro | 405 | 410 | 415 |     |
| Ser | Pro | Ser | Ser | Ser | Pro | Ser | Ser | Ser | Pro | Ser | Pro | Ser | Pro | Ser | Pro | 420 | 425 | 430 |     |
| Ser | Ala | Ser | Pro | Ser | Ala | Ser | Pro | Ser | Ala | Ser | Ser | Ser | Pro | Ser | Pro | 435 | 440 | 445 |     |
| Ser | Pro | Ser | Ser | Ser | Pro | Val | Ser | Gly | Gly | Val | Lys | Val | Gln | Tyr | Lys | 450 | 455 | 460 |     |
| Asn | Asn | Asp | Ser | Ala | Pro | Gly | Asp | Asn | Gln | Ile | Lys | Pro | Gly | Leu | Gln | 465 | 470 | 475 | 480 |

Leu Val Asn Thr Gly Ser Ser Ser Val Asp Leu Ser Thr Val Thr Val  
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 Arg Tyr Trp Phe Thr Arg Asp Gly Gly Ser Ser Thr Leu Val Tyr Asn  
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 Cys Asp Trp Ala Ala Met Gly Cys Gly Asn Ile Arg Ala Ser Phe Gly  
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 Ser Val Asn Pro Ala Thr Pro Thr Ala Asp Thr Tyr Leu Gln Leu Ser  
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 Phe Thr Gly Gly Thr Leu Ala Ala Gly Gly Ser Thr Gly Glu Ile Gln  
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 Tyr Ser Tyr Gly Thr Asn Thr Ala Phe Gln Asp Trp Thr Lys Val Thr  
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 Val Tyr Val Asn Gly Arg Leu Val Trp Gly Thr Glu Pro Ser Gly Thr  
 595 600 605  
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&lt;210&gt; 2

&lt;211&gt; 2289

&lt;212&gt; DNA

&lt;213&gt; Acidothermus cellulolyticus

&lt;400&gt; 2

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ccgtcgaccg gcgctccggc gtacaacgac gggccgaccg gcttgcaagg ccttgactac 420
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&lt;210&gt; 3

&lt;211&gt; 375

&lt;212&gt; PRT

&lt;213&gt; Artificial Sequence

&lt;220&gt;

&lt;223&gt; Description of Artificial Sequence: GH5 catalytic domain

&lt;400&gt; 3

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Ala Pro Ala Gly Phe Val Thr Ala Ser Gly Gly Gln Phe Val Leu Asn
  1                      5                      10                     15

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|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |  |  |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|--|--|
| Gly | Leu | Pro | Tyr | Arg | Tyr | Gly | Gly | Thr | Asn | Asn | Tyr | Tyr | Leu | Ser | Tyr |  |  |  |
|     |     |     | 20  |     |     |     |     | 25  |     |     |     |     | 30  |     |     |  |  |  |
| Gln | Ser | His | Ala | Asp | Val | Asp | Asp | Val | Leu | Ala | Lys | Ala | Gln | Ala | Met |  |  |  |
|     |     | 35  |     |     |     |     | 40  |     |     |     |     | 45  |     |     |     |  |  |  |
| Asn | Leu | Ser | Val | Ile | Arg | Thr | Trp | Gly | Phe | Ile | Asp | Ile | Gly | Ser | Leu |  |  |  |
|     | 50  |     |     |     |     | 55  |     |     |     |     | 60  |     |     |     |     |  |  |  |
| Asp | Gly | Ser | Val | Pro | Thr | Ile | Asp | Gly | Asn | Lys | Asn | Gly | Phe | Tyr | Phe |  |  |  |
| 65  |     |     |     |     | 70  |     |     |     |     | 75  |     |     |     |     | 80  |  |  |  |
| Gln | Tyr | Trp | Asp | Pro | Ser | Thr | Gly | Ala | Pro | Ala | Tyr | Asn | Asp | Gly | Pro |  |  |  |
|     |     |     |     | 85  |     |     |     |     | 90  |     |     |     |     |     | 95  |  |  |  |
| Thr | Gly | Leu | Gln | Gly | Leu | Asp | Tyr | Ala | Ile | Ala | Ser | Ala | Ala | Ala | His |  |  |  |
|     |     |     | 100 |     |     |     |     | 105 |     |     |     |     |     | 110 |     |  |  |  |
| Gly | Leu | Arg | Val | Ile | Val | Val | Leu | Thr | Asn | Asp | Trp | Lys | Glu | Phe | Gly |  |  |  |
|     |     | 115 |     |     |     |     | 120 |     |     |     |     | 125 |     |     |     |  |  |  |
| Gly | Met | Asp | Gln | Tyr | Asp | Lys | Trp | Tyr | Gly | Leu | Pro | Tyr | His | Asp | Asn |  |  |  |
|     | 130 |     |     |     |     | 135 |     |     |     |     | 140 |     |     |     |     |  |  |  |
| Phe | Tyr | Thr | Asp | Pro | Arg | Thr | Gln | Gln | Ala | Tyr | Lys | Asn | Trp | Val | Asn |  |  |  |
| 145 |     |     |     |     | 150 |     |     |     |     | 155 |     |     |     |     | 160 |  |  |  |
| His | Leu | Leu | Asn | Arg | Val | Asn | Ser | Ile | Thr | Gly | Val | Thr | Tyr | Lys | Asn |  |  |  |
|     |     |     |     | 165 |     |     |     | 170 |     |     |     |     |     | 175 |     |  |  |  |
| Asp | Pro | Thr | Ile | Phe | Ala | Trp | Glu | Leu | Ala | Asn | Glu | Pro | Arg | Cys | Val |  |  |  |
|     |     |     | 180 |     |     |     |     | 185 |     |     |     |     | 190 |     |     |  |  |  |
| Gly | Ser | Gly | Thr | Leu | Pro | Thr | Ser | Gly | Thr | Cys | Thr | Gln | Ala | Thr | Ile |  |  |  |
|     |     | 195 |     |     |     |     | 200 |     |     |     |     | 205 |     |     |     |  |  |  |
| Val | Asn | Trp | Val | Asp | Gln | Met | Ser | Ala | Tyr | Val | Lys | Ser | Ile | Asp | Pro |  |  |  |
|     | 210 |     |     |     |     | 215 |     |     |     |     | 220 |     |     |     |     |  |  |  |
| Asn | His | Met | Val | Ser | Val | Gly | Asp | Glu | Gly | Phe | Tyr | Ile | Gly | Ser | Thr |  |  |  |
| 225 |     |     |     |     | 230 |     |     |     |     | 235 |     |     |     |     | 240 |  |  |  |
| Gln | Gly | Ser | Gly | Trp | Pro | Tyr | Asn | Asp | Pro | Ser | Asp | Gly | Val | Asp | Asn |  |  |  |
|     |     |     |     | 245 |     |     |     | 250 |     |     |     |     |     | 255 |     |  |  |  |
| Asn | Ala | Leu | Leu | Arg | Val | Lys | Asn | Ile | Asp | Phe | Gly | Thr | Tyr | His | Leu |  |  |  |
|     |     |     | 260 |     |     |     |     | 265 |     |     |     |     | 270 |     |     |  |  |  |
| Tyr | Pro | Asn | Tyr | Trp | Gly | Gln | Asn | Ala | Asp | Trp | Gly | Thr | Gln | Trp | Ile |  |  |  |
|     |     | 275 |     |     |     |     | 280 |     |     |     |     |     | 285 |     |     |  |  |  |
| Lys | Asp | His | Ile | Ala | Asn | Ala | Ala | Ala | Ile | Gly | Lys | Pro | Thr | Ile | Leu |  |  |  |
|     | 290 |     |     |     |     | 295 |     |     |     |     | 300 |     |     |     |     |  |  |  |
| Glu | Glu | Phe | Gly | Trp | Gln | Thr | Pro | Asp | Arg | Asp | Ser | Val | Tyr | Gln | Thr |  |  |  |
| 305 |     |     |     |     | 310 |     |     |     |     | 315 |     |     |     |     | 320 |  |  |  |

Trp Thr Gln Thr Val Arg Thr Asn Gly Glu Ala Gly Trp Asn Phe Trp  
 325 330 335

Met Leu Ala Gly Asn Val Asn Gly Gln Pro Tyr Pro Asn Tyr Asp Gly  
 340 345 350

Phe Asn Val Tyr Tyr Pro Ser Ser Thr Ala Thr Val Leu Ala Ser Glu  
 355 360 365

Ala Leu Ala Ile Ser Thr Gly  
 370 375

<210> 4

<211> 154

<212> PRT

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Carbohydrate  
 binding domain

<400> 4

Val Ser Gly Gly Val Lys Val Gln Tyr Lys Asn Asn Asp Ser Ala Pro  
 1 5 10 15

Gly Asp Asn Gln Ile Lys Pro Gly Leu Gln Leu Val Asn Thr Gly Ser  
 20 25 30

Ser Ser Val Asp Leu Ser Thr Val Thr Val Arg Tyr Trp Phe Thr Arg  
 35 40 45

Asp Gly Gly Ser Ser Thr Leu Val Tyr Asn Cys Asp Trp Ala Ala Met  
 50 55 60

Gly Cys Gly Asn Ile Arg Ala Ser Phe Gly Ser Val Asn Pro Ala Thr  
 65 70 75 80

Pro Thr Ala Asp Thr Tyr Leu Gln Leu Ser Phe Thr Gly Gly Thr Leu  
 85 90 95

Ala Ala Gly Gly Ser Thr Gly Glu Ile Gln Asn Arg Val Asn Lys Ser  
 100 105 110

Asp Trp Ser Asn Phe Asp Glu Thr Asn Asp Tyr Ser Tyr Gly Thr Asn  
 115 120 125

Thr Ala Phe Gln Asp Trp Thr Lys Val Thr Val Tyr Val Asn Gly Arg  
 130 135 140

Leu Val Trp Gly Thr Glu Pro Ser Gly Thr  
 145 150

<210> 5

<211> 101

<212> PRT

<213> Artificial Sequence

&lt;220&gt;

&lt;223&gt; Description of Artificial Sequence: Carbohydrate binding domain

&lt;400&gt; 5

Gly Val Gly Cys Arg Ala Thr Tyr Val Val Asn Ser Asp Trp Gly Ser  
 1 5 10 15  
 Gly Phe Thr Ala Thr Val Thr Val Thr Asn Thr Gly Ser Arg Ala Thr  
 20 25 30  
 Ser Gly Trp Thr Val Ala Trp Ser Phe Gly Gly Asn Gln Thr Val Thr  
 35 40 45  
 Asn Tyr Trp Asn Thr Ala Leu Thr Gln Ser Gly Ala Ser Val Thr Ala  
 50 55 60  
 Thr Asn Leu Ser Tyr Asn Asn Val Ile Gln Pro Gly Gln Ser Thr Thr  
 65 70 75 80  
 Phe Gly Phe Asn Gly Ser Tyr Ser Gly Thr Asn Thr Ala Pro Thr Leu  
 85 90 95  
 Thr Cys Thr Ala Ser  
 100

&lt;210&gt; 6

&lt;211&gt; 375

&lt;212&gt; PRT

&lt;213&gt; Acidothermus cellulolyticus

&lt;400&gt; 6

Ala Pro Ala Gly Phe Val Thr Ala Ser Gly Gly Gln Phe Val Leu Asn  
 1 5 10 15  
 Gly Leu Pro Tyr Arg Tyr Gly Gly Thr Asn Asn Tyr Tyr Leu Ser Tyr  
 20 25 30  
 Gln Ser His Ala Asp Val Asp Asp Val Leu Ala Lys Ala Gln Ala Met  
 35 40 45  
 Asn Leu Ser Val Ile Arg Thr Trp Gly Phe Ile Asp Ile Gly Ser Leu  
 50 55 60  
 Asp Gly Ser Val Pro Thr Ile Asp Gly Asn Lys Asn Gly Phe Tyr Phe  
 65 70 75 80  
 Gln Tyr Trp Asp Pro Ser Thr Gly Ala Pro Ala Tyr Asn Asp Gly Pro  
 85 90 95  
 Thr Gly Leu Gln Gly Leu Asp Tyr Ala Ile Ala Ser Ala Ala Ala His  
 100 105 110  
 Gly Leu Arg Val Ile Val Val Leu Thr Asn Asp Trp Lys Glu Phe Gly  
 115 120 125

Gly Met Asp Gln Tyr Asp Lys Trp Tyr Gly Leu Pro Tyr His Asp Asn  
 130 135 140  
 Phe Tyr Thr Asp Pro Arg Thr Gln Gln Ala Tyr Lys Asn Trp Val Asn  
 145 150 155 160  
 His Leu Leu Asn Arg Val Asn Ser Ile Thr Gly Val Thr Tyr Lys Asn  
 165 170 175  
 Asp Pro Thr Ile Phe Ala Trp Glu Leu Ala Asn Glu Pro Arg Cys Val  
 180 185 190  
 Gly Ser Gly Thr Leu Pro Thr Ser Gly Thr Cys Thr Gln Ala Thr Ile  
 195 200 205  
 Val Asn Trp Val Asp Gln Met Ser Ala Tyr Val Lys Ser Ile Asp Pro  
 210 215 220  
 Asn His Met Val Ser Val Gly Asp Glu Gly Phe Tyr Ile Gly Ser Thr  
 225 230 235 240  
 Gln Gly Ser Gly Trp Pro Tyr Asn Asp Pro Ser Asp Gly Val Asp Asn  
 245 250 255  
 Asn Ala Leu Leu Arg Val Lys Asn Ile Asp Phe Gly Thr Tyr His Leu  
 260 265 270  
 Tyr Pro Asn Tyr Trp Gly Gln Asn Ala Asp Trp Gly Thr Gln Trp Ile  
 275 280 285  
 Lys Asp His Ile Ala Asn Ala Ala Ala Ile Gly Lys Pro Thr Ile Leu  
 290 295 300  
 Glu Glu Phe Gly Trp Gln Thr Pro Asp Arg Asp Ser Val Tyr Gln Thr  
 305 310 315 320  
 Trp Thr Gln Thr Val Arg Thr Asn Gly Glu Ala Gly Trp Asn Phe Trp  
 325 330 335  
 Met Leu Ala Gly Asn Val Asn Gly Gln Pro Tyr Pro Asn Tyr Asp Gly  
 340 345 350  
 Phe Asn Val Tyr Tyr Pro Ser Ser Thr Ala Thr Val Leu Ala Ser Glu  
 355 360 365  
 Ala Leu Ala Ile Ser Thr Gly  
 370 375

<210> 7

<211> 356

<212> PRT

<213> Agaricus bisporus

<400> 7

Val Ser Thr Gly Phe Val Lys Ala Ser Gly Thr Arg Phe Thr Leu Asn  
 1 5 10 15



|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Gly | Gln | Lys | Tyr | Thr | Val | Val | Gly | Gly | Asn | Ser | Tyr | Trp | Val | Gly | Leu | 20  | 25  | 30  |     |
| Thr | Gly | Leu | Ser | Thr | Ser | Ala | Met | Asn | Gln | Ala | Phe | Ser | Asp | Ile | Ala | 35  | 40  | 45  |     |
| Asn | Ala | Gly | Gly | Thr | Thr | Val | Arg | Thr | Trp | Gly | Phe | Asn | Glu | Val | Thr | 50  | 55  | 60  |     |
| Ser | Pro | Asn | Gly | Asn | Tyr | Tyr | Gln | Ser | Trp | Ser | Gly | Ala | Arg | Pro | Thr | 65  | 70  | 75  | 80  |
| Ile | Asn | Thr | Gly | Ala | Ser | Gly | Leu | Leu | Asn | Phe | Asp | Asn | Val | Ile | Ala | 85  | 90  | 95  |     |
| Ala | Ala | Lys | Ala | Asn | Gly | Ile | Arg | Leu | Ile | Val | Ala | Leu | Thr | Asn | Asn | 100 | 105 | 110 |     |
| Trp | Ala | Asp | Tyr | Gly | Gly | Met | Asp | Val | Tyr | Val | Asn | Gln | Met | Val | Gly | 115 | 120 | 125 |     |
| Asn | Gly | Gln | Pro | His | Asp | Leu | Phe | Tyr | Thr | Asn | Thr | Ala | Ile | Lys | Asp | 130 | 135 | 140 |     |
| Ala | Phe | Lys | Ser | Tyr | Val | Arg | Thr | Phe | Val | Ser | Arg | Tyr | Ala | Asn | Glu | 145 | 150 | 155 | 160 |
| Pro | Thr | Val | Met | Ala | Trp | Glu | Leu | Ala | Asn | Glu | Pro | Arg | Cys | Lys | Gly | 165 | 170 | 175 |     |
| Ser | Thr | Gly | Thr | Thr | Ser | Gly | Thr | Cys | Thr | Thr | Thr | Thr | Val | Thr | Asn | 180 | 185 | 190 |     |
| Trp | Ala | Lys | Glu | Met | Ser | Ala | Phe | Ile | Lys | Thr | Ile | Asp | Ser | Asn | His | 195 | 200 | 205 |     |
| Leu | Val | Ala | Ile | Gly | Asp | Glu | Gly | Phe | Tyr | Asn | Gln | Pro | Gly | Ala | Pro | 210 | 215 | 220 |     |
| Thr | Tyr | Pro | Tyr | Gln | Gly | Ser | Glu | Gly | Val | Asp | Phe | Glu | Ala | Asn | Leu | 225 | 230 | 235 | 240 |
| Ala | Ile | Ser | Ser | Val | Asp | Phe | Ala | Thr | Phe | His | Ser | Tyr | Pro | Glu | Pro | 245 | 250 | 255 |     |
| Trp | Gly | Gln | Gly | Ala | Asp | Ala | Lys | Ala | Trp | Gly | Thr | Gln | Trp | Ile | Thr | 260 | 265 | 270 |     |
| Asp | His | Ala | Ala | Ser | Met | Lys | Arg | Val | Asn | Lys | Pro | Val | Ile | Leu | Glu | 275 | 280 | 285 |     |
| Glu | Phe | Gly | Val | Thr | Thr | Asn | Gln | Pro | Asp | Thr | Tyr | Ala | Glu | Trp | Phe | 290 | 295 | 300 |     |
| Asn | Glu | Val | Glu | Ser | Ser | Gly | Leu | Thr | Gly | Asp | Leu | Ile | Trp | Gln | Ala | 305 | 310 | 315 | 320 |



|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Thr | Asp | Phe | Ala | Lys | Asn | Val | Gln | Ile | Lys | Ser | Leu | Asp | Phe | Gly | Thr |
| 225 |     |     |     |     | 230 |     |     |     |     | 235 |     |     |     |     | 240 |
| Phe | His | Leu | Tyr | Pro | Asp | Ser | Trp | Gly | Thr | Asn | Tyr | Thr | Trp | Gly | Asn |
|     |     |     |     | 245 |     |     |     |     | 250 |     |     |     |     | 255 |     |
| Gly | Trp | Ile | Gln | Thr | His | Ala | Ala | Ala | Cys | Leu | Ala | Ala | Gly | Lys | Pro |
|     |     |     | 260 |     |     |     |     | 265 |     |     |     |     | 270 |     |     |
| Cys | Val | Phe | Glu | Glu | Tyr | Gly | Ala | Gln | Gln | Asn | Pro | Cys | Thr | Asn | Glu |
|     |     | 275 |     |     |     |     | 280 |     |     |     |     | 285 |     |     |     |
| Ala | Pro | Trp | Gln | Thr | Thr | Ser | Leu | Thr | Thr | Arg | Gly | Met | Gly | Gly | Asp |
|     | 290 |     |     |     |     | 295 |     |     |     |     | 300 |     |     |     |     |
| Met | Phe | Trp | Gln | Trp | Gly | Asp | Thr | Phe | Ala | Asn | Gly | Ala | Gln | Ser | Asn |
| 305 |     |     |     |     | 310 |     |     |     |     | 315 |     |     |     |     | 320 |
| Ser | Asp | Pro | Tyr | Thr | Val | Trp | Tyr | Asn | Ser | Ser | Asn | Trp | Gln | Cys | Leu |
|     |     |     |     | 325 |     |     |     |     | 330 |     |     |     |     | 335 |     |
| Val | Lys | Asn | His | Val | Asp | Ala | Ile | Asn | Gly |     |     |     |     |     |     |
|     |     |     | 340 |     |     |     |     | 345 |     |     |     |     |     |     |     |